DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"

Understanding the Transport Properties and the Topological Character of $ZrTe_5$

Introduce
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Abstract

Recently, $ZrTe_5$ has been matter of renewed interests and debates since it has been proposed alternatively as a 3D Dirac semimetal [1], a prototype of weak topological insulator [2] or a topological insulator in proximity of a topological phase transition [3].
However, in spite of these novel studies and models some fundamental questions concerning the large positive thermopower at room temperature and its sign switching at $T^* \approx 160$ K [4], where the resistivity reaches the maximum[5], remain unexplained [4,6].
Here, by using Angle Resolved Photoelectron Spectroscopy (ARPES) in the time domain we have been able to unveil the origin of the anomalous transport properties along with the possibility of manipulating the transport properties of the material in the ultrafast time scales [7].
Furthermore, Ultra Violet (UV) and Soft X-ray (SX) ARPES have revealed the behaviour of the band structure dispersion of this material. These novel results have been used to benchmark ab-initio fully relativistic calculations, showing the clear dependence of the electronic structure upon the interlayer distances, as measured by X-ray diffraction (XRD).
These findings, combined with scanning tunneling spectroscopy (STS) data suggest that $ZrTe_5$ has all the characters qualifying the strong topological insulators [8].

[1] Qiang Li et al., Nature Physics (2016), doi:10.1038/nphys3648.
[2] R. Wu et al., arXiv:1601.07056 (2015)
[3] H. Weng et al., Physical review X 4, 011002 (2014).
[4] T. E. Jones et al., Solid State communications 11, 793 (1982).
[5] E. F. Skelton et al., Solid state communications 42, 1 (1982).
[6] M. Rubinstein, Phys. Rev. B 60, 1627 (1999).
[7] G. Manzoni et al., Phys. Rev. Lett. 115, 207402 (2015).
[8] G. Manzoni et al., submitted to Phys. Rev. Lett. (2016).

Seminario

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